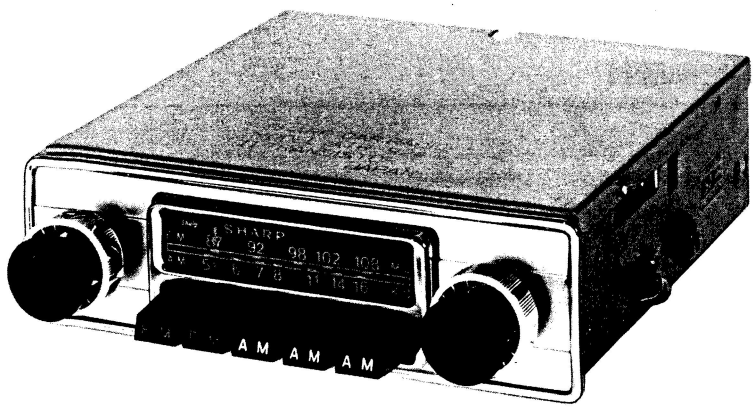
# SHARP Service Manual




MODEL

ATR-924

## SPECIFICATIONS

| | |
|---|---|
| Frequency Range: | AM: 530–1605kHz<br>FM: 87–108MHz |
| Intermediate Frequency: | AM: 455kHz FM: 10.7MHz |
| Power Supply: | 12V/6V (+) or (–) grounding |
| Power Output: | 5W/2.5W |
| Speaker: | 6-1/4" Permanent Dynamic Speaker with speaker box |
| Dimensions: | 2"(H) X 5"(D) X 6-1/4"(W) |
| Weight: | 4.0 lbs. |

Transistor Complement:

| | | |
|---|---|---|
| TR. 1 | 2SA440 | FM RF Amplifier |
| TR. 2 | 2SA235 | FM Mixer |
| TR. 3 | 2SA235 | FM Oscillator |
| TR. 4 | 2SA355 | AM RF Amplifier |
| TR. 5 | 2SA234 | AM Converter<br>FM 1st IF Amplifier |
| TR. 6 | 2SA234 | AM 1st IF Amplifier<br>FM 2nd IF Amplifier |
| TR. 7 | 2SA234 | AM 2nd IF Amplfier<br>FM 3rd IF Amplifier |
| TR. 8 | 2SB75 | AF Amplifier |
| TR. 9 | 2SB75 | Driver |
| TR.10, 11 | 2SB368 | Output |

## GENERAL DESCRIPTION

The circuitry used in this car radio incorporates 11 transistors, 7 diodes and 1 thermistor.

A external antenna feeds the AM broadcasting signal to the AM RF amplifier and converter.

After going through 2 IF amplifiers and 1 diode detector, the signal passes through a 4 transistor audio amplifier circuit.

A external antenna feeds the FM broadcasting signal to the FM RF amplifier and mixer.

After going through 3 IF amplifier and 2 diodes detector, the signal passes through a 4 transistor audio amplifier circuit.

An AVC voltage is fed back to RF amplifier and IF amplifier.

## CHASSIS REMOVAL

1. Remove 3 cover retaining screws.
2. Remove the cover.
3. Remove 4 screws located on the printed circuit board.
4. Remove the output transformer leads, and tuner lead.

SHARP CORPORATION OSAKA, JAPAN

# ALIGNMENT INSTRUCTION

Should it become necessary at any time to check the alignment of this receiver, proceed as follows;

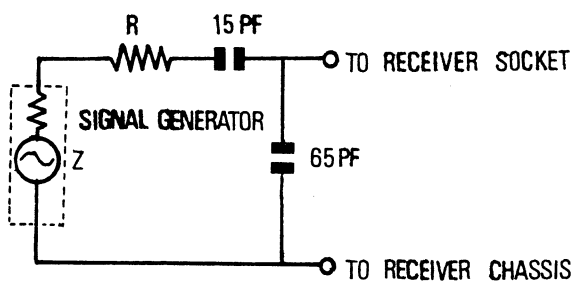
1) Connect an output meter across the speaker voice coil lugs.
2) Set the volume control at maximum.
3) Use the lowest setting of signal generator capable of producing adequate indication on the lowest scale of output metere.
4) Use a non-metallic alignment tool.
5) Repeat adjustments to insure good results.

## ALIGNMENT

| Signal generator | | | | Receiver | | |
|---|---|---|---|---|---|---|
| Step | Band | Connection to receiver | Input signal frequency | Dial setting | Remarks | Adjustment |
| 1 | A M | Connect signal generator through the *dummy to the external antenna. | Exactly 455kHz. (400Hz, 30%, AM modulated.) | The highest frequency | Adjust for maximum output on speaker voice coil lugs. | 3rd–IF Trans. core<br>2nd–IF Trans. core<br>1st–IF Trans. core |
| 2 | A M | Same as step 1 | Exactly 520kHz, (400Hz, 30%, AM modulated.) | The lowest frequency | Same as step 1 | AM Oscillator core (L4) |
| 3 | A M | Same as step 1 | Exactly 1650kHz. (400Hz, 30%, AM modulated.) | Same as step 1 | Same as step 1 | AM Oscillator trimmer (C5) |
| 4 | A M | Same as step 1 | Exactly 1400 kHz. (400Hz, 30%, AM modulated.) | 1400kHz. | Same as step 1 | AM Antenna trimmer (C3), RF trimmer (C4) |
| 5 | A M | Repeat steps 2, 3 and 4 until no further improvement can be made. | | | | |

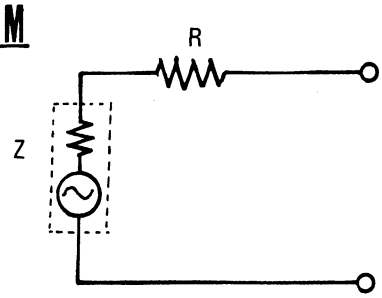
## * APPOINTED DUMMY ANTENNA

**AM**




R=80–Z(OHM); OUTPUT IMPEDANCE OF SIGNAL GENERATOR

**FM**




R=75–Z(OHM)

| Signal generator | | | | Receiver | | Adjustment |
|---|---|---|---|---|---|---|
| Step | Band | Connection to receiver | Input signal frequency | Dial setting | Remarks | |
| 1 | F M | Connect signal generator through a 10KΩ dummy to converter emitter, test point 1, of TR2. Ground lead to the receiver chassis | Exactly 10.7MHz. (400Hz, 30%, FM modulated) | The lowest frequency range. | Connect receiver chassis through a 0.05MFD condenser to IF3 collector test point 2, of TR5. Adjust for maximum output on test point 3. | 3rd–IF Trans. core IFT–3<br>2nd–IF Trans. core IFT–2<br>1st–IF Trans. core IFT–1 |
| 2 | F M | Same as step 1. | Exactly 10.7MHz. (Unmodulated) | Same as step 1. | See Note below. | Discriminator trans. core. IFT–4 |
| 3 | F M | Connect signal generator through a 75Ω, including output impedance of signal generator to the external antenna socket. Ground lead to the receiver chassis. | Exactly 110MHz. (400Hz, 30%, FM modulated) | The highest frequency | Adjust for maximum output on speaker voice coil lugs. | FM Oscillator trimmer (C2) |
| 4 | F M | Same as step 3. | 86.5 MHz±0.5MHz, (400Hz, 30%, FM modulated) | The lowest frequency | Same as step 3. | FM Oscillator trimmer (C2) |
| 5 | FM | Same as step 3. | Exactly 98 MHz, (400Hz, 30%, FM modulated) | 98MHz | Same as step 3. | FM RF trimmer (C1) |
| 6 | F M | Repeat steps 3, 4 and 5 until no further improvement can be made. | | | | |

## NOTE

1) Connect VTVM (0.1 volts range D.C. scale) across volume control of receiver. (Grounded terminal to high side of control.)
2) Adjust discriminator Sec. core for VTVM 0 volt.
3) Change signal generator frequency 10.7MHz + 100kHz and – 100kHz approximately.
4) Adjust discriminator Pri. core for balanced peaks. Peak separation should be approximately 200kHz.

# CHASSIS LAYOUT

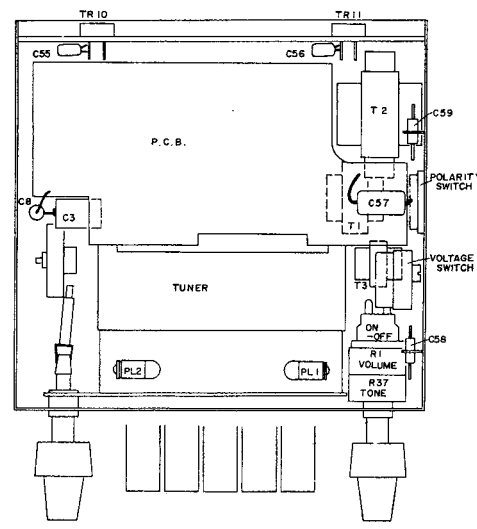



Figure 1

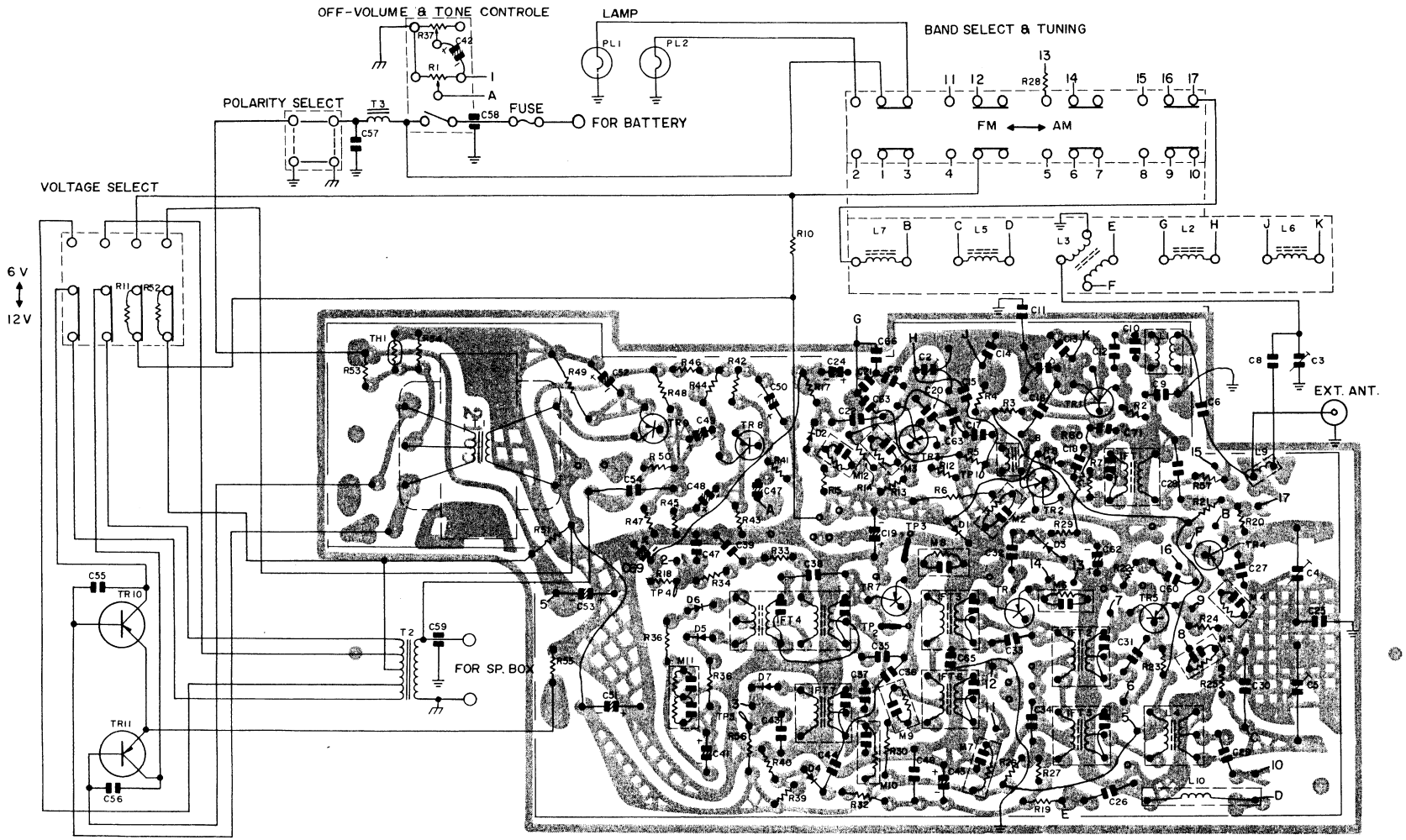
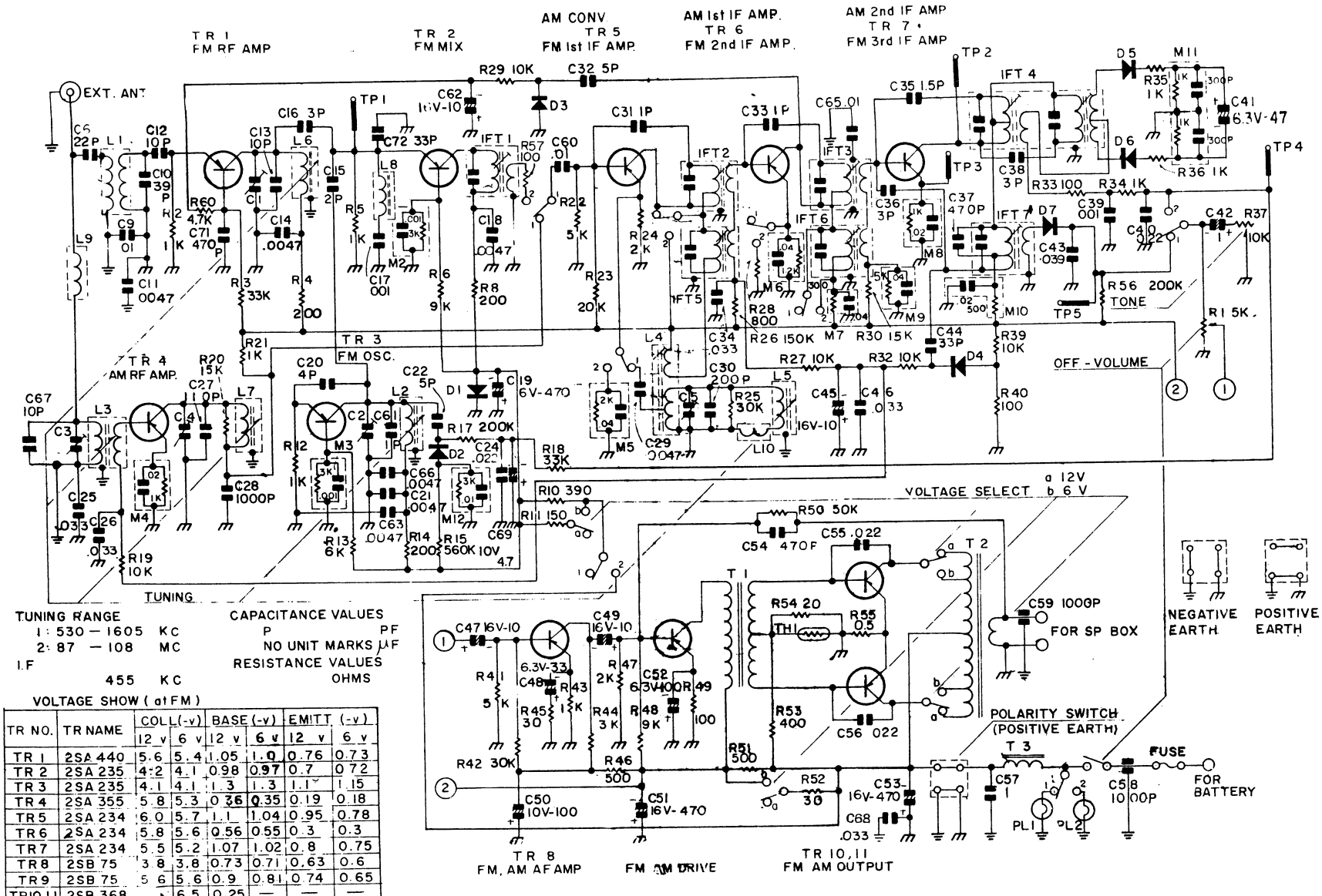



Figure 2 Wiring Side of P.C. Board




TUNING RANGE
1: 530 — 1605 KC
2: 87 — 108 MC

I.F
455 KC

CAPACITANCE VALUES
P PF
NO UNIT MARKS μF
RESISTANCE VALUES
OHMS

VOLTAGE SHOW ( at FM )

| TR NO. | TR NAME | COLL (-v) | | BASE (-v) | | EMITT (-v) | |
|---|---|---|---|---|---|---|---|
| | | 12 v | 6 v | 12 v | 6 v | 12 v | 6 v |
| TR 1 | 2SA 440 | 5.6 | 5.4 | 1.05 | 1.0 | 0.76 | 0.73 |
| TR 2 | 2SA 235 | 4.2 | 4.1 | 0.98 | 0.97 | 0.7 | 0.72 |
| TR 3 | 2SA 235 | 4.1 | 4.1 | 1.3 | 1.3 | 1.1 | 1.15 |
| TR 4 | 2SA 355 | 5.8 | 5.3 | 0.36 | 0.35 | 0.19 | 0.18 |
| TR 5 | 2SA 234 | 6.0 | 5.7 | 1.1 | 1.04 | 0.95 | 0.78 |
| TR 6 | 2SA 234 | 5.8 | 5.6 | 0.56 | 0.55 | 0.3 | 0.3 |
| TR 7 | 2SA 234 | 5.5 | 5.2 | 1.07 | 1.02 | 0.8 | 0.75 |
| TR 8 | 2SB 75 | 3.8 | 3.8 | 0.73 | 0.71 | 0.63 | 0.6 |
| TR 9 | 2SB 75 | 5.6 | 5.6 | 0.9 | 0.81 | 0.74 | 0.65 |
| TR10,11 | 2SB 368 | | 6.5 | 0.25 | — | — | — |

Figure 3 Schematic Diagram

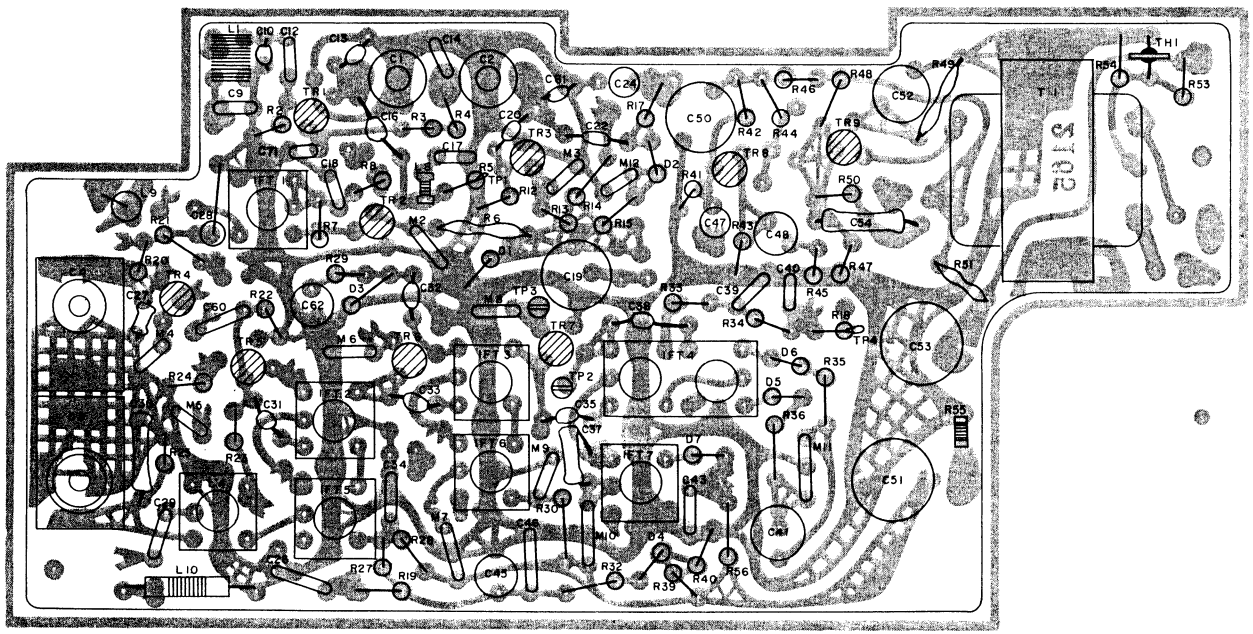



Figure 4 Component Side of P.C. Board

# PARTS LIST

## CAPACITORS

| REF. NO | PART NO. | DESCRIPTION |
|---|---|---|
| C1 | TO-839 | Trimmer, FM RF |
| C2 | TO-705 | Trimmer, FM Oscillator |
| C3, C5 | TO-827 | Trimmer, AM Antenna |
| C4 | TO-846 | Trimmer, AM RF |
| C6 | D-5-228J | 22PF, 50V, ±5%, Discap |
| C9, C60, C65 | D-5-105Z | .01MFD, 50V, Discap |
| C10 | D-5-398J | 39PF, 50V, ±5%, Discap |
| C11, C14, C18, C21, C63, C66 | D-5-476Z | .0047MFD, 50V, Discap |
| C12, C13, C67 | D-5-108F | 10PF, 50V, ±1%, Discap |
| C15 | D-5-209C | 2PF, 50V, ±0.25PF, Discap |
| C16, C36, C38 | D-5-309C | 3PF, 50V, ±0.25PF, Discap |
| C17, C39 | D-5-106P | .001MFD, 50V, Discap |
| C19 | CU-06-471Q | 470MFD, 6.3V, Electrolytic |
| C20 | DKK-5-409C | 4PF, 50V, ±0.25PF, Discap |
| C22, C32 | D-5-509D | 5PF, 50V, ±0.5PF, Discap |
| C24 | D-5-225Z | .022MFD, 50V, Discap |
| C25, C26, C34, C46, C68 | D-5-335P | .033MFD, 50V, Discap |
| C27 | DS-5-117J | 110PF, 50V, ±5%, Discap |
| C28 | S-5-106J | .001MFD, 50V, ±5%, Styrol |
| C29 | ML-5-476M | .0047MFD, 50V, ±20%, Mylar |
| C30 | DSH-5-207J | 200PF, 50V, ±5%, Discap |
| C31, C33, C61 | D-5-109C | 1PF, 50V, ±0.25PF, Discap |
| C35 | D-5-159C | 1.5PF, 50V, ±0.25PF, Discap |
| C37, C54, C71 | DS-5-477J | 470PF, 50V, ±5%, Discap |
| C40, C55, C56 | ML-5-225M | .022MFD, 50V, ±20%, Mylar |
| C41 | CU-06-472Q | 47MFD, 6.3V, Electrolytic |
| C42 | K-TOK-CON | .1MFD, 6.3V, Special |
| C43 | ML-5-395M | .039MFD, 50V, ±20%, Mylar |
| C44, C72 | DS-5-338J | 33PF, 50V, ±5%, Discap |
| C45, C47, C49, C62 | CU-1.6-102Q | 10MFD, 16V, Electrolytic |
| C48 | CU-06-332Q | 33MFD, 6.3V, Electrolytic |
| C50 | CU-1-101Q | 100MFD, 10V, Electrolytic |
| C51, C53 | CU-1.6-471Q | 470MFD, 16V, Electrolytic |
| C52 | CU-06-101Q | 100MFD, 6.3V, Electrolytic |
| C57 | HMP-15-104K | .1MFD, 150V, ±10%, Paper |
| C58, C59 | CP-8 | 1000MFD, 500V, Feed Thru |
| C69 | CU-1-473R | 4.7MFD, 10V, Electrolytic |

## RESISTORS

| REF. NO | PART NO. | DESCRIPTION |
|---|---|---|
| R1, R37 | 8V-823 | Variable Resistor with Switch 5k ohm and 10K ohm |
| R2, R5, R12, R21, R34, R35, R36, R43 | ¼SU-1KK | 1K ohm |
| R3 | ¼SU-33KK | 33K ohm |
| R4, R8, R14 | ¼SU-200K | 200 ohm |
| R6, R48 | ¼SU-9KK | 9K ohm |
| R10 | ¼SA-390K | 390 ohm |
| R11 | ¼SA-150K | 150 ohm |
| R13 | ¼SU-6KK | 6K ohm |
| R15 | ¼SU-560KK | 560K ohm |
| R17, R56 | ¼SA-200KK | 200K ohm |
| R18 | ¼SA-33KK | 33K ohm |
| R19, R27, R29, R32, R39 | ¼SU-10KK | 10K ohm |
| R20, R30 | ¼SU-15KK | 15K ohm |
| R22, R41 | ¼SU-5KK | 5K ohm |
| R23, R24, R47 | ¼SU-20KK | 20K ohm |
| R25, R42 | ¼SU-2KK | 2K ohm |
| R26 | ¼SU-30KK | 30K ohm |
| R28 | ¼SU-150KK | 150K ohm |
| R33, R40, R49, R57 | ¼SA-800K | 800 ohm |
| R44 | ¼SU-100K | 100 ohm |
| R45 | ¼SU-3KK | 3K ohm |
| R46, R51 | ¼SU-30K | 30 ohm |
| R50 | ¼SU-500K | 500 ohm |
| R52 | ¼SU-50KK | 50K ohm |
| R53 | ½SA-400K | 30 ohm |
| R54 | ¼SU-20K | 400 ohm, ½W, 10%, Carbon |
| R55 | ½K-1K | 20 ohm |
| R60 | ¼SU-4.7KK | 1 ohm, ½W, 10%, Winding |
| | | 4.7K ohm |

* All resistors without specification are ¼W, 10%, Carbon type

## PACKAGED CIRCUIT

| | | | |
|---|---|---|---|
| M2, M3 | PRC-344 | Capristor | (3K ohm + .001 MFD) |
| M4, M8 | PRC-332 | Capristor | (1K ohm + .01 MFD) |
| M5 | PRC-317 | Capristor | (2K ohm + .04 MFD) |
| M6 | PRC-313 | Capristor | (1.2K ohm + .04 MFD) |
| M7 | PRC-308 | Capristor | (300 ohm + .04 MFD) |
| M9 | PRC-304 | Capristor | (5K ohm + .04 MFD) |
| M10 | PRC-345 | Capristor | (500 ohm + .02 MFD) |
| M11 | PRC-333 | Capristor | (1K ohm X2 + 300PF X2) |
| M12 | PRC-350 | Capristor | (3K ohm + .01MFD) |

## COILS AND TRANSFORMERS

| | | |
|---|---|---|
| L1 | 8L-128A | Coil, FM Antenna |
| L4 | 7L-490B | Coil, AM Oscillator |
| L8 | 7L-925 | Coil, Emitter Choke |
| L9 | 7L-920 | Coil, Antenna Choke |
| L10 | 7L-906 | Coil, AM Oscillator Compensating |
| IFT 1 | 7IF-735 | Transformer, FM 1st IF |
| IFT 2 | 7IF-767 | Transformer, FM 2nd IF |
| IFT 3 | 7IF-745 | Transformer, FM 3rd IF |
| IFT 4 | 7IF-739 | Transformer, FM 4th IF |
| IFT 5 | 7IF-800 | Transformer, AM 1st IF |
| IFT 6 | 7IF-765 | Transformer, AM 2nd IF |
| IFT 7 | 7IF-801 | Transformer, AM 3rd IF |
| T1 | 6T-807 | Transformer, Input |
| T2 | 7T-824 | Transformer, Output |
| T3 | 9T-733 | Transformer, Power Choke |

## SEMICONDUCTORS

| | | |
|---|---|---|
| TR 1 | 2SA440A | FM RF Amplifier |
| TR 2 | 2SA235 | FM Mixer |
| TR 3 | 2SA235 | FM Oscillator |
| TR 4 | 2SA355 | AM RF Amplifier |

# PARTS LIST

| REF. NO | PARTS NO. | DESCRIPTION | |
|---|---|---|---|
| TR 5 | 2SA234 | AM Converter/1st FM IF Amplifier | |
| TR 6 | 2SA234 | 1st AM IF & 2nd FM IF Amplifier | |
| TR 7 | 2SA234 | 2nd AM IF & 3rd FM IF Amplifier | |
| TR 8 | 2SB75 | AF Amplifier | |
| TR 9 | 2SB75 | Driver | |
| TR10, TR11 | 2SB368 | Audio Output | |
| D1 | TR4S | Diode, Power Stabilizer | |
| D2 | 1S-85 | Diode, AFC | |
| D3 | 1N34A | Diode, FM AVC | |
| D4 | 1N34A | Diode, AM AVC | |
| D5, D6 | 1N60 | Diode, FM Detector | |
| D7 | 1N34A | Diode, AM Detector | |
| TH-1 | D-1A | Thermistor, AOC | |

## MISCELLANEOUS

| | | | |
|---|---|---|---|
| | X9CAB-165A | Cabinet, Body | |
| | X9CAB-165B | Cabinet, Cover | |
| | DIAL-165 | Dial | |
| | 9K-394 | Knob, (Small) | |
| | 9K-395 | Knob, (Large) | |
| | DEC-M-131B | Decoration Metal | |
| | DEC-M-165A | Decoration Metal | |
| | DIAL-P131A | Plate, Dial | |
| | S-BUTA-165 | Cover, Bottom | |
| | FH-927 | Holder, Fuse | |
| | X4S-29 | Switch, Power Source Change | |
| | XSPT-924 | Tuner | |
| | PL-512 | Pilot Lamp | |
| | PG-169 | Plug, Polarity Selector | |
| | PL-DEC-COV | Decoration Cover, Pilot Lamp | |
| | SO-965 | Socket, External Antenna | |
| | SO-950 | Socket, Polarity Selector | |
| | SO-218 | Socket, Pilot Lamp | |
| | PL-ANG165A | Angle, Pilot Lamp | |
| | PL-ANG165B | Angle, Pilot Lamp | |
| | 3FUSE-1.2A | Fuse, 1.2A | |
| | PCB-165 | Printed Circuit Board | |
| | XCP-23-1 | Speaker Box, Assembly | |

B1056-2M
Printed in Japan